

of England. My attention was drawn to it by a letter from Mr. W. Hearder, of Plymouth, which appeared in the 'Field' and other newspapers of August 27th, and in which the fish is described as the "Glaucus" (*Lichia glauca*). However, on being kindly shown the fish by Mr. Hearder, I recognized it as a Vadigo.

The preservation of this specimen is due to the Very Rev. Canon H. H. Du Boulay, of Prussia Cove, Marazion, who states that it was caught on August 23rd in a pollack-net off Prussia Cove. The discoverer generously at once acceded to my request of depositing it in the British Museum. The fish is in excellent condition and nearly of the same size as the one obtained in 1888, viz. 19 inches.

I may mention on this occasion that during the summer of the present year fresh specimens of *Centrina Salviani* were exposed for sale in the markets of London as well as Plymouth. As one or two individuals of this shark are known to have been caught on the British coast some years ago, it is of importance to know that the specimens of the present year were not British, but, as Mr. Calderwood, the Director of the Laboratory of the Marine Biological Association, informs me, were brought by trawlers who fish in or about the Bay of Biscay, carrying their fish into British ports. Exposure for sale in a fresh state in the London markets has ceased to be evidence of a fish having been obtained within the British area.

P.S.—Mr. G. A. Musgrave, Pres. Torquay Nat. Hist. Soc., has kindly informed me that two other specimens of the Vadigo were obtained on the South Devon coast simultaneously with the Cornish specimen, viz. in Babbicombe, and the other in Oddicombe Bay.

On the Stridulating-apparatus of the Red Ocypode Crab. By
A. ALCOCK, M.B.

Several years ago Professor Wood-Mason demonstrated to me the fact, that in both males and females of the red Ocypode crab that swarms on all the sandy shores of India, the bigger of the two chelæ, or nippers, bears across the "palm" a long finely-toothed ridge, and on one of the basal joints of the "arm" against which the "palm" can be tightly closed, a second similar ridge; and that, when the "palm" is so folded against the base of the "arm," the first ridge can be worked across the second, like a bow across a fiddle—only in this case the bow is several times larger than the fiddle.

The remarkable resemblance of the whole arrangement to the stridulating-apparatus of many insects, led Professor Wood-Mason, who is an authority on the subject, to infer a similarity of function; and Professor Wood-Mason requested me to observe the crabs during life, and to listen for the sounds which he supposed them to be capable of producing. I have this season heard the sounds, and I am now able to give the actual facts that establish the truth of Professor Wood-Mason's *à priori* inference. In order to understand the value, and what may be called the evolutional coefficient, of

such an apparatus, the life-history of these crabs must first be briefly noticed.

They are gregarious, and though at times they may be seen marching (migrating?) in battalions across the sand, they usually live in "warrens" at and about high-water mark, where they excavate tortuous burrows, methodically turning over the surface of the surrounding sand for any particles of food that it may contain, and when alarmed flying each one to its burrow. Their chief enemy appears to be the common red-and-white kite. Now the use of the stridulating-organ appears to be this, that when a crab has entered its burrow it may, by the utterance of warning notes, prevent other crabs from crowding in on top of it. It is easy to imagine that, in the consternation of a sudden hostile surprise, several crabs might fly for refuge to the same burrow, with the result that both the lawful occupant and the intruders might be stifled, or crushed, or in some way injured, and it is easy to understand that the power of uttering a warning signal would protect the lawful occupant from such harm. That, when intrusion does take place, the sound is feared by the intruder, I shall presently show.

The possible reciprocal advantage to the other crabs from such warning we must pass by, in discussing the origin of the stridulating-organ; for, although the crabs are gregarious, there appears to be no social co-operation whatever, and we can assume that individual structural modifications exist for the good of all the members of a flock only when there *is* social co-operation.

The sounds can be heard, and their effects seen, by forcing one crab, which we will call the intruder, into the burrow of another, which we will call the rightful owner. The intruder shows the strongest reluctance to enter, and will take all the risks of open flight rather than do so, and, when forced in, he keeps as near the mouth of the burrow as possible. When the rightful owner discovers the intruder he utters a few broken tones of remonstrance, on hearing which the intruder, if permitted, will at once leave the burrow. If the intruder be prevented from making his escape, the low and broken tones of the rightful owner gradually rise in loudness and shrillness and frequency until they become a continuous low-pitched whirr, or high-pitched growl, the burrow acting as a resonator.

One has often to wait quietly for a long time, until the alarm of the appearance of an enemy has subsided, before the rightful owner discovers the intruder and begins to stridulate; and had it not been for a happy accident I should not this season have repeated experiments that three years ago, owing to my impatience, were unsuccessful. I need hardly say that what little credit there is in this discovery is entirely due to Professor Wood-Mason, who directed my attention to the subject, and who has stores of knowledge accumulated upon stridulation in crustaceans. And in the 'Descent of Man,' p. 274 (2nd edition), there is a reference to Hilgendorf's discovery of possible stridulating-organs in the higher crustacea.—From the *Administration Report of the Marine Survey of India* for 1891-92.